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(54) Title: SEED COATING

(57) Abstract

A hygroscopic coating composition for seeds which comprises finely divided polyacrylamide, finely divided polyacrylate and preferably finely divided graphite as a sticker. The coating composition when coated on seeds facilitates the germination of the seeds after sowing by providing moisture to the seeds. Preferred particle sizes for components are also described.

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- 1 -

"SEED COATING"TECHNICAL FIELD

The invention concerns a water absorbent coating composition for seeds which, by its water absorbency, facilitates the germination of the seeds upon sowing.

BACKGROUND ART

In the past, seeds have been planted and allowed to germinate naturally. The germination mainly depends on the climatic conditions present at the time and the moisture and fertility of the soil. A critical factor for initiating the germination process is for there to be sufficient moisture available to allow the seed to sprout. This mainly depends upon the rain as well as the general agricultural and farming conditions. Farmers therefore normally sow their crops after substantial rain has fallen, although there may be adequate sub-surface moisture in the soil.

Therefore, there would be many advantages in finding a way of allowing seeds to germinate in dryer climatic conditions than normally required for germination. This is particularly important for dry land farming, in countries having agricultural areas with low rainfall. It would therefore be advantageous to develop a coating for seeds which is hygroscopic in nature, which is able to concentrate moisture at the seed, and hence initiate germination.

It is an object of the invention to provide an effective hygroscopic or water absorbent coating composition, which can be coated on seeds, and which, by its hygroscopic properties facilitates seed germination.

DISCLOSURE OF INVENTION

The invention therefore concerns a hygroscopic coating composition for seeds comprising finely divided polyacrylamide and finely divided polyacrylate in intimate admixture. Preferably this hygroscopic composition also includes finely divided graphite as a sticker.

The seeds which can be coated with this composition are any plant seeds which require moisture for germination. For example, suitable seeds are wheat, oats, maize, sorghum, oil seeds, beans, cotton, pasture grasses, lucerne and

- 2 -

5 vegetables. The coating composition is particularly useful
with summer crops.

 The composition is hygroscopic and is able to absorb
water. The composition should have a high capacity for
absorbing moisture. The composition should be kept away
from contact with moisture or water until it has been coated
10 on the seed, and preferably until the coated seed has been
sown in the ground. However, it is possible to moisten the
coating mixture before or after it is coated on the seed, in
order to provide additional moisture to the seed at the time
it is sown.

15 Most preferably the coating composition includes a
sticker such as finely divided natural graphite. If
graphite is not used the seeds may be coated with a sticker
such as vegetable oil, gum arabic or some similar sticker.

 The coating composition of the invention concerns a
20 combination of a finely divided polyacrylate and a finely
divided polyacrylamide. The mixture of these two provides a
surprisingly effective hygroscopic coating composition. The
reasons for this unexpected efficacy are not precisely
understood, but it is believed that the mixture attracts
25 comic components to the seed required for germination, as
well as moisture.

 The various components of the coating composition are
finely divided. This is important to allow the coating
composition to adhere to the seed, and to allow efficient
30 moisture transfer to the surface of the seed. Preferably,
the polyacrylamide has a particle size less than 1000 micron
and the polyacrylate has a particle size less than 1000
micron. Preferably also, the graphite, if used, has a
particle size less than about 200 micron.

35 Preferably also, the polyacrylamide is present in the
composition in two different particle size ranges, one of
said ranges being greater than 200 micron and the other less
than 200 micron.

 Preferably, the polyacrylate has a particle size
between 10 and 200 micron. Most preferably, the
polyacrylate has a grain size of about 60 micron.



- 3 -

More preferably, the polyacrylamide is present in one particle size range of 200 to 1000 micron, and most preferably about 300 micron, and in another size range from 1 to 200 micron, most preferably about 20 micron.

5 Also preferably, the graphite has a particle size between about 10 to 20 micron.

The coating composition can also include a fertilizer, fungicide and/or insecticide for example. The fungicide or insecticide so used can be any of the commonly used
10 compounds known to be effective for application to seeds when sowing crops. The fertilizer can be any suitable fertilizer, and preferably it is a slow release formulation. The term "fertilize" includes nitrogen fixing bacteria, which can be added as an inoculate for promoting
15 growth of the seed. The fungicide, pesticide, or fertilizer additive may be incorporated in the coating composition, or may only be added when the coating is applied to the seed. If incorporated in the coating composition at manufacture, the additive should be in a finely ground state. The
20 preferred starch grafted polyacrylate component of the invention is also a particularly good carrier for the nitrogen fixing bacteria.

The invention also concerns a method of facilitating the germination of seeds, which comprises coating the seeds
25 with the hygroscopic coating composition described above, sowing the coated seeds, and allowing the seeds to germinate. Alternatively, the coating composition can be applied to the seeds at the time they are sown. Water can be injected into the furrow otherwise added with the seed,
30 in conjunction with the sowing process.

The invention also includes a packaged seed coating composition which comprises the dry hygroscopic coating composition as described above, which is enclosed within a moisture and waterproof package. It is preferred to keep
35 the hygroscopic composition dry until it is used to coat the seed. This facilitates the coating process and reduces weight for transportation and storage of the composition before use.



- 4 -

The coating may otherwise be used as an aqueous slurry, in conjunction with direct drill seeding machinery. In this case, soil moisture levels will not be such a critical factor for determining sowing times, and farmers can sow their crops irrespective of soil moisture levels. For example, the coating composition maybe mixed with water at a ratio of about 300-400:1 as water : coating composition. The slurry thus obtained is pumped, gravity fed or injected into the soil or in the bottom of the furrow. Seeds can then be sown on top.

The polyacrylate of the invention is preferably an internally cross-linked starch-grafted polyacrylate, which is made from starch and acrylic acid. Such a polymer will generally be super absorbent and able, for example, to absorb up to 1000 times its weight of water. This polymer should also be substantially water insoluble. A suitable such polyacrylate is one produced by Sanyo Chemical Industries of Japan and is known as "SANWET IM-1000". This is a super absorbent internally cross-linked starch-grafted polyacrylate. This substance is a white powder able to absorb 1000 times its weight in water. This has a particle distribution of about 1% having greater than 20 mesh particles, about 89% having 20 to 145 mesh, and about 10 wt% having a particle size of under 145 mesh particles. This will be purchased having a moisture content of less than about 7 wt%. Before use, this polymer is ground to a suitable particle size in accordance with the preferred embodiments of the invention; for example, to about 60 micron.

The polyacrylamide may be an amonic polymer or a cationic polymer, for example.

The polyacrylamide can be a cross-linked acrylamide copolymer able to absorb many times its weight of water. One suitable such polyacrylamide is manufactured by Allied Colloids of Yorkshire, England, and is sold under the trade name "ALCOSORB AB1". This is a water absorbable, water insoluble polymer able to absorb more than 70 times its weight of water. It is obtained as a white granular powder



- 5 -

having a moisture content generally from 5 to 7% by weight. This is ground to smaller particle sizes, as preferred in the invention; for example, one portion being about 300 micron and the other portion being about 20 micron in grain size. An alternate polyacrylamide is manufactured by the S.N.F. Company of France and is sold under the trade name "AQUASORB PR3005". This polymer can absorb about 30 or about 500 times its weight in water respectively. Again the polymer is ground to the desired particles sizes before use.

It is preferred that about equal quantities of each component are incorporated in the composition. An ideal formulation is as follows:

33.3% natural graphite; particles 10 to 20 micron
33.3% internally cross-linked starch-grafted polyacrylate; particles about 60 micron
16.0% cross-linked polyacrylamide; particles about 300 micron
17.4% cross-linked polyacrylamide; particles about 20 micron.

This formulation is able to absorb about 300 times its weight in water.

The coating composition is applied to the seed in sufficient quantity to coat the seed. Typically, about 1 kg of coating composition will be used per about 100 kg to 400 kg of seed. For fine seed, about 100 kg of seed is coated with 1 kg of coating composition. However for wheat seed it is preferred that 400 kg of seed will be coated per 1 kg of coating composition.

BEST MODES OF CARRYING OUT THE INVENTION

The above seed coating is used in conjunction with normal agricultural practices. It is preferably dusted dry onto the seeds prior to sowing. With small quantities of seed, the seed coating composition and the seed can be placed in a sealed container and shaken or tumbled for about 1 minute to coat the seeds. If greater quantities of seeds are used, the seeds can be placed in a concrete mixer or tumbler in about 100kg lots, together with sufficient seed coating composition. The seeds are coated after operating

- 6 -

the machine for about a minute. When coating a tonne or more of seed, it is preferred to use commercially available mixing machines for coating the seed.

5 It has been found that the seed coating of the invention can substantially improve germination rates; particularly on dry land or irrigated crops. It has been found that crop emergence is faster, there is an increased rate of germination, and also that the root development
10 substantially deeper and stronger. These advantages enable a higher crop production and earlier maturity of the crops and there is the further advantage that the plants, due to their deeper root systems, are less likely to suffer the effects of water stress while young.

15 A further advantage is that it appears that the preferred graphite component of the mixture has a mild fungicidal and insecticidal action, protecting the seed. The graphite acts as a sticker to adhere the composition to the seed, and furthermore, it operates as a lubricant to
20 assist in the sowing process of the coated seeds.

EXAMPLE

The coating composition of the invention was tested in a cotton crop near Wee Waa in New South Wales, Australia. Cotton seeds were coated in a seed box prior to sowing.
25 About 1kg of coating composition was used for each 200 kg of cotton seed. The crop was sown and it was found that the coated crop appeared from the ground after four days, while normally germination can take up to a fortnight. The actual improvement in germination time is of course dependent on
30 the climatic and soil conditions, but generally, the coated seed crops appear faster than uncoated crops. Results to date also show an improved crop yield from coated seeds as compared with untreated seed.

35 The coating composition is generally inexpensive to apply the crop and has been found to provide substantial advantages to crop growth, as well as crop yields.

INDUSTRIAL APPLICABILITY

The coating composition of the invention is applicable



- 7 -

to agriculture, horticulture and the growing of plants from seeds.



- 8 -

CLAIMS

1. A hygroscopic coating composition for seeds, which comprises finely divided polyacrylamide and finely divided polyacrylate in intimate admixture.
2. The coating composition of claim 1, which also includes a sticker
3. The coating composition of claim 2 wherein the sticker is finely divided graphite.
4. The coating composition of claim 3, wherein the particle size of the polyacrylamide and the polyacrylate is less than 1000 micron and that of graphite is less than 200 micron.
5. The coating composition of claim 4, wherein the polyacrylamide is present in two particle size ranges, one of said ranges less than 200 micron and the other of said ranges greater than 200 micron.
6. The coating composition of claim 5, wherein the particle size of said polyacrylate is about 60 micron, the two particle sizes of said polyacrylamide are about 20 micron and about 30 micron, and the particle size range of the graphite is between about 10 and 20 micron.
7. The coating composition of claim 1, wherein the polyacrylate is a cross-linked starch-grafted polyacrylate.
8. The coating composition of claim 1, which also includes any one or more of fertilizers, insecticides or fungicides.
9. A packaged seed coating composition comprising the dry hygroscopic coating composition of claim 1 enclosed within a moisture and waterproof package.
10. A seed when coated with the coating composition defined in any one of claims 1 to 9.
11. A method of facilitating the germination of seeds, comprising coating said seeds with the hygroscopic coating composition as defined in any one of claims 1 to 8, sowing said coated seeds and allowing said seeds to germinate.

SUPPLEMENTARY REPORT

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU84/00203

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

II. FIELDS SEARCHED

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III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
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E	WO,A,85/00001(KIRKLAND et al) 3 January 1985 (03.01.85) (& AU,A,30637/84)	
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IV. CERTIFICATION

Date of the Actual Completion of the International Search

Date of Mailing of this International Search Report

(26.06.85) 26 JUNE 1985

International Searching Authority

Signature of Authorized Officer

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